CAUSES OF DELAY AND TIME PERFORMANCE ON CONSTRUCTION PROJECTS – “THE GHANAIAN CASE”

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SEPTEMBER, 2019
DECLARATION

I hereby declare that, except for references to works that have been duly cited, this long essay is the result of my original research, and it has neither in whole nor in part been presented for another degree elsewhere.

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CERTIFICATION

I hereby certify that the supervision of this long essay is in accordance with procedures laid down by University of Ghana.

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DR. VERA FIADOR DATE
(SUPERVISOR)
DEDICATION

To God Almighty and my entire family, especially my parents, Mr. and Mrs. Amankwah Yeboah and my siblings.
ACKNOWLEDGEMENTS

My first and foremost appreciation goes to the Almighty God, who has kindly granted me strength and wisdom to successfully embark on this academic endeavour.

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ABSTRACT

There is an increase in the number of construction projects undergoing delays and this has led to budget and time overruns in Ghana. Using the data set of 230 questionnaires received from respondents, this study examined the causes of delay and time performance on government-funded projects. The Mean Score Ranking as well as the Relative Importance Index (RII) was used to make inferences from the data collected. The results pointed out that the most significant causes of delay are insufficient funding from clients, delay in payments due the contractors, and poor project planning. Effects of these delays as deduced from the data analyses are cost overruns, time overruns and loss of revenue. Six strategies to mitigate these delays are also developed in this study. This study provided practitioners with mitigation measures in order to achieve successful construction projects.
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CHAPTER ONE
INTRODUCTION

1.1 BACKGROUND TO THE RESEARCH

The construction industry plays a pivotal role in any country’s socio-economic development (Osei, 2013). Additionally, the industry holds immense potential for growth stimulation, furthering project exports and creation of jobs (ibid). In their study, Serdar and Syuhaida (2012) found a positive connection between construction productivity and economic growth, especially in developing countries. Khan (2005) posited, therefore, that the construction industry has great importance to the achievement of socio-economic goals of any growing nation. He further postulated that the construction industry is responsible for the provision of infrastructure such as schools, offices, hospitals, accommodation, sewerage and water supply, as well as employment of skilled, unskilled and semi-skilled labour.

Since the provision of these infrastructure, in Ghana, is mostly the responsibility of government, the national construction division happens to be one of the fastest growing sector with a remarkable average growth of 7% to 8% per annum as stated in the study of Osei (2013). The Ghana Statistical Service (2015:3) reported that “the construction industry is the largest activity within the secondary sector with a growth rate of 30.6% and a share of 14.8% of nominal Gross Domestic Product (GDP)”. The report went further to explain that the industry has chalked some marginal growth from 26.6% in 2014 to 26.9% in 2015 with regard to its contribution to the industry sector.

The contribution made by the construction industry in the aggregate economy of a country has been addressed by a number of researchers, and they were of the view that there is a linkage between the construction sector and other sectors of the economy (Serdar & Syuhaida, 2012).
The construction industry is complex in its nature as it involves contracting parties like; clients, contractors, consultants and regulators (Melba, Dhanya, & Ganapathy, 2015).

Subramani, Sruthi, and Kavitha (2014:3) defined “a construction project as a high-value, time-bound, special construction mission with some predetermined performance objectives”. A project requires resources in the form of labour, materials and equipment for its successful completion (Chitkara, 2011). An effective and efficient project is one that has attained its technical performance, maintained its schedule and remained within the planned budgeted costs (Frimpong & Oluwoye, 2003). The construction industry is becoming increasingly complex in nature due to regular evolving uncertainties in budgets and technological advancement (Ilori & Omopariola, 2018). According to the findings of Ilori and Omopariola (2018), these uncertainties often lead to delays in construction projects and subsequently affect the project performance.

1.2 PROBLEM STATEMENT

The construction industry as stated earlier aids in the development of an economy but delay is a performance deficiency factor, which affects the successful completion of projects. A delay of a construction project is said to be an overrun in time, either beyond a project’s time to be finished, or away from the period established by the contracting parties for the project’s delivery to the client (Ramanathan, Narayanan, & Idrus, 2012). Construction projects across the globe in the report of Ghiasi (2016) are said to be characterized by delays, especially during the construction phase.

A deficiency faced by the construction industry worldwide are delays (Sambasivan & Soon, 2007). There has been a number of studies with regard to delays worldwide. According to Odeh and Battaineh (2002), most government projects are faced constantly with prolonged interruptions, to the displeasure of the various stakeholders, and this brings about an extension
in the agreed completion time. A study done by Famiyeh, Amoatey, Adaku and Agbenohevi (2017) on projects executed in a few educational institutions in some parts of Ghana indicated that finances, unrealistic timelines stipulated by clients, cost under-estimation by consultants, poor definition of project scope, excessive variations orders issued by clients, and other factors are major causes of delay. Likewise, Amoatey, Ameyaw, Adaku, and Famiyeh (2015) also conducted a research on the causes of project delays. The result of the analysis indicated that the main factors that causes projects to delay include late payments made to contractors, inflation/a hike in price of materials, financiers/clients given insufficient funds, and unstable financial/capital market. Project delays have unfavourable out-turn and they are potential cause of increase in total projects charge, exceeding in completion time, litigation, and client’s desire to discontinue a project.

In Ghana, few works have been embarked on on project delays. One of such research was done by Frimpong and Oluwoye (2003), who investigated on important factors that bring about delay and cost overrun in underground construction projects. Similarly, Fugar and Agyarkwah-Baah (2010) also undertook a study to identify the causes of delay in building construction projects.

Fugar and Agyarkwah-Baah (2010) stated that the Ghanaian construction industry suffers from delays and it leads to an overrun in time, cost escalation and sometimes total desertion of the projects. Yet, studies on causes, effects and measures to mitigate delays on public funded construction projects in Ghana could not be found in published literature. It is with regard to this gap that this study investigates the factors that cause project delays and the effects of project delays of public funded projects.

1.3 RESEARCH OBJECTIVES

In order to achieve the aim set out for the study, the spelt out objectives were as follows:
• To identify the causes of delays on government-funded projects within the Ghanaian construction industry; and
• To determine the effects of delays on government-funded projects.

1.4 RESEARCH QUESTIONS
In order for the stated objectives of the study to be achieved, the under listed questions are answered by the study:

1. What are the causes of delays on government-funded construction projects?
2. What are the effects of delays on government-funded projects?

1.5 SIGNIFICANCE OF THE RESEARCH
The research will bring about an additional literature on the happenings within the construction industry. It would serve as a guide for policy makers, consultants, contractors and clients in addressing factors that give rise to project delays and its associated consequences to the industry and the nation as a whole. Increase in awareness of these delays in the industry, which this study seeks to bring forth, will result in stakeholders putting into practice decent project control methods. Furthermore, this study will bring to light effects stemming from these delays and the consequences of project delays on the economy.

1.6 RESEARCH LIMITATIONS
This research has its focus primarily on Clients (i.e. Ministry of Works and Housing and Ministry of Roads and Highways) and Consultants working in the Greater Accra Region of Ghana. Only Consultants’ whose firms are registered with professional bodies like Ghana Institute of Architects (GIA), Ghana Institution of Engineering (GhIE) and Ghana Institution of Surveyors (GhIS) will be surveyed. Some Contractors may be included in the survey but these shall be limited to those working on major government infrastructural projects. However, the findings of the study will be generalized for all stakeholders involved in the construction
industry. In addition, each research is time bound and so is this research, from its conception to completion.

1.7 CHAPTER OUTLINE

The structure of this study is organized into five (5) interdependent chapters. The first chapter presents the “Introduction” which includes the study’s background, the aims and questions to be answered at the end of the research, the significance of the study as well as limitations of the study and the outline of the chapters. The “Literature Review” constitutes the Chapter 2. It sets the theoretical grounds for the thesis and gives an overview of concepts and terms. The review provides an extensive analysis on previous studies. “Research Methodology” forms the third Chapter, which stresses on the methodological viewpoint to be used. The outcome of the data gained from participants and further discussion of results is presented in Chapter 4. The final chapter concludes the thesis by summarizing the findings of the research. It provides the conclusion of the study and highlights the substantial contributions this study provides to knowledge alongside recommendations for further research to be done in the forthcoming years.
CHAPTER TWO
LITERATURE REVIEW

2.1 INTRODUCTION

In this section of the thesis, existing studies done by other researchers on the dire elements that accounts for retardation on projects and the consequent effects have been reviewed. The chapter also suggests solutions to help alleviate these project delays.

2.2 DEFINITION OF PROJECT

Rafat & Ahmed (2017), describes a project as an impermanent endeavour begun in order to deliver a unique product or service within a given period. Rauzana (2016) considers construction projects as a succession of developments related to the construction industry which is time bound with specific apportionment of resources to enable a particular goal to be achieved. She went on to say that the four elements that constitute a project are cost, quality, quantity and time.

2.3 CONSTRUCTION PROJECTS IN GHANA

The construction industry as reported by Mukuka, Aigbavboa and Thwala (2013), is one crucial sector that contributes to a country’s advancement and economic development. Ghana Statistical Service (2015:3) has pointed out that, “the construction industry is the biggest activity within the industry sector with a steady growth rate of 30.6% and a share of 14.8% of nominal Gross Domestic Product (GDP)”. It is therefore not surprising that the government is considered as a major stakeholder in the industry and serves as the main client of most infrastructural projects in Ghana. According to Ofori (2010), the construction industry contributes enormously to the socio-economic expansion of the country through the supply of infrastructure that aids in the production of goods and services. The industry is multi-layered and cuts across every sector of the economy. It include buildings, roads, bridges, harbours, airports, factories, and dams.
(Ghana Statiscal Service, 2015). These are national assets due to its capital intensity. However, project delays are more predominant on government projects.

2.4 DELAYS ON CONSTRUCTION PROJECTS

Construction delay can be explained to be a condition in which a project exceeds its expected completion date (Binti Musa, 2012). She further stressed that delays can upset a work’s sequence since the work will not be completed within the approved agreement period. Delays occurring on projects was defined by Assaf and Al-Hejji (2006) as time exceeding the agreed finishing date in the signed contract or further than the period approved by the various stakeholders for the project to be completed.

The study conducted by the researchers also added that a client interprets delay as loss of income as a result of dependence on existing rented facilities, lack of productivity and lettable space, amongst others. They also stated that contractors view delays as higher overhead costs as a result of an upsurge in labour and plants’ cost due to longer working days and an increase in material costs due to changes in certain economic indices such as inflation and currency fluctuations. A research conducted by Fobi (2014) explained that when there is a project delays, it leads to longer working periods, which means that the project has gone beyond its due date for completion that was agreed by the various stakeholders. He made it known also that delay is one of the nearly inevitable problems in the built environment and it is a common worldwide occurrence.

2.4.1 Brief Background to Universal Project Delays

Delays as stated by Sambasivan and Soon (2017) is expounded as a general occurrence in the construction industry. A study conducted by Mizanur, Dai, and Khanh (2014) suggested some major causes of delays. In their discoveries, they found out that adverse weather conditions, uneven site conditions, late deliveries, user changes in drawings, late designs, and unstable
economic conditions contributed enormously to a project delaying. That study also proposed that when the causes of delay are tackled, it could help the several parties to the contract involved in each phase of the construction to reduce contract disputes to the barest minimum.

Delay is almost an inevitable happening on most Ghanaian construction projects as well. It involves many multifaceted problems which are very important to the various stakeholders involved in the project.

Currently, parties involved on a project are concerned more about the length of time a project takes due to increase in inflation, commercial pressures and interest rate, and the likelihood to result in disputes and entitlements leading to a lawsuit (Fugar & Agyarkwah-Baah, 2010).

2.5 THEORETICAL OVERVIEW OF DELAYS ON CONSTRUCTION PROJECTS

Project delays typically end up in crashing and this practically has the project end resulting in added cost (Sambasivan, Deepak, Salim, & Ponniah, 2017). Mukuka, Aigbavboa and Thwala (2013) were of the view that, activities if not managed well, can result in project delays. They clarified that delay groupings are mainly reliant on the sort and enormity of an activity’s influence on the on-going project and who is accountable for the delay among the parties. Various writers have suggested several groupings but most of these groupings have many similarities. One such writers is Trauner (2009), who has categorised delays into four: critical and Non-critical, Concurrent and non-concurrent, Excusable and non-excusable and Compensable and non-compensable.

2.5.1 Excusable and Non-Excusable

2.5.1a Excusable Delay

Trauner (2009) illuminated that excusable delays emanate from unforeseen occurrences, usually outside the contractor’s control. He further stated that general labour strikes, natural events like floods, earthquakes, extreme weather conditions, fires, and client-directed changes
are some occurrences that result in this type of delay. These events are generally defined in the signed agreement to which reference is made in the analysis of a delay. The agreement ought to assert clearly the constituents that are regarded rational delays on a project which validate an extension in length of time caused by meteorological conditions, irrespective of its rare nature or how unforeseen they are.

2.5.1b Non-Excusable delay

Unlike the excusable delays, non-excusable delays are predictable happenings, which falls under the domain of a contractor (Trauner, 2009). Non-excusable delays include premature execution by suppliers, defective work through the contractor, late performance of subcontractors and labour unrests.

2.5.2 Compensable and Non-Compensable Delay

On the report of Trauner (2009), compensable delay is a situation in which the contractor is eligible for an extension in the duration of site works. It should be noted the only delays deemed as excusable delays could be compensable.

In spite of the occurrence of an excusable delay, a non-compensable delay signifies that, the contractor is not eligible to any extra recompense for the time lost. Conversely, a non-excusable delay permits no more extra time or any additional recompense. Trauner (2009) further expatiated that the criteria for the determination of a delay as compensable or otherwise are clearly spelt out in the contract document. A contract specifically states which delay can be considered as non-compensable, that the Contractor should not gain any monetary compensation or extension of time. Agreements between stakeholders of any projects tell the difference between compensable and non-compensable delays in a lot of ways (Trauner, 2009).
2.5.3 Critical and Non-Critical Delays

Critical delays as described by Muhammed (2015) are happenings that inhibit the contractor from concluding the scheduled programme of works on the due period time as agreed upon in the contract. He further explained that this type of delay stems from the Critical Path Method (CPM) plan, which assists to determine happenings in the works schedule that would have an effect on the duration of works if delayed. Trauner (2009) stated that the principal focus of every research undertaken on delays in a project is to find out how these delays will influence the completion time. He stated also that delays that bring about an extension of the projects’ duration are known as critical and the particular ones that do not upset the realization of the project is denoted as non-critical delays.

Inferring to a study undertaken by Muhammed (2015), he detailed the importance of noting that regardless of the mode one picks to evaluate a project plan to ascertain delays, a superseding component that requires extra observation will be a factor. This is identified as the concurrent facts which talks about the daily reports, the plans in effect and any job information existing to mirror situations at the time of the delay. Non-critical delays, according to Muhammed (2015), are those that affect work progress but do not have an effect on the end result or the closing date of the project. He intimated additionally that both excusable and non-excusable delays are types of critical delays.

2.5.4 Concurrent Delays

Concurrent delays are those that ensue at matching time but are independent of the critical path (Trauner, 2009). Mubarak (2005) further explained that, this category of delays contains a blend of dual or added autonomous reasons of delay taking place within the same time.
A study conducted by Fobi (2014) termed concurrent delay as an overlapping delay. He specified that this type of delay can perhaps be generated by the client or the contractor. He stated that both parties are accountable, and none of them can recover indemnities.

2.6 EMPIRICAL STUDIES ON CAUSES OF PROJECT DELAYs

Disputes with contractor payments, mismanagement of works by contractor, insufficient technical proficiency and materials escalation are some major factors recognized by Rafat and Ahmed (2017) as responsible for project delays. They further indicated that ineffectual contractors, substandard construction designs, poor valuation, unprofessional conduct on site, procedurals violation, change in resource orders, insufficient planning and lack of adequate communication among stakeholders were some other factors that brought about delays on projects.

2.7 RELATED RESEARCH WORKS

Many studies undertaken in the construction industry have been centred on causes of project delay. A research carried out by Assaf and Al-Hejji (2006), outlined some major generation of delays on huge construction projects. They identified factors including financial problems, changes in initial designs, delay in taking of decision and given of consents by client, complications in gaining work permit from appropriate authorities, synchronization and communication problems as responsible for project delays.

Sixteen key determinants that bring about project delays and escalation of project costs in Nigeria were researched by Mansfield, Ugwu and Daran (1994). They gathered and collected data using questionnaires from stakeholders in the built environment such as clients, consultants and contractors. They reported that some key factors that can be blamed for project delays include inaccurate estimation, price instability, materials shortage, incompetency in contract management, finance and payment arrangements.
Likewise, a study was conducted on construction delays in Thailand by Ogunlana, Promkunthong and Jearjirm (1996). The findings of the study showed that inadequate resource supply and incompetency on the part of some contractors are the prime causes of project delays.

Sunjka and Jacob (2013) have categorised the causes of project delays as clients’ associated problems, consultant-connected concerns, contractor-interconnected problems, materials-linked issues, labour, plant and equipment related issues, community-affiliated, and contractual-related. In their study, it was noted that insufficient funding from the client or funding agency, delay in payment for completed works, constant intrusion with project performance by client, unfeasible apportionment of resources, unworkable contract duration, incorrect choosing of consultants and contractors, inappropriate method of construction, lack of adequate forecasting, incompetency in managing of project site, inexperienced site manpower, improper selection of plants and equipment, and scarcity of materials contribute hugely to project delays.

Furthermore, a survey undertaken by Kasimu and Issah (2012) revealed that lack of interest by the interested party on the project, exclusion by powers that be, waste of time, money and reputation deterioration are the four (4) major factors that cause project delays. Some other vital bases of delay on some construction projects in Egypt from the assessment of the major stakeholders include clients, consultants and contractors. These researchers further identified procedures aimed at curtailing an upsurge in cost (Abd El-Razek, Bassioni, & Mobarak, 2008).

Plant, equipment, labour and material delays are the main causes of contractors’ performance delays in the United Kingdom (Abd. Majid & McCaffer, 1998). Kaming, Olomolaiye, Holt, and Harris (1997) to find out some delay variables in Indonesian multistory construction undertook a questionnaire survey. They realized changes in design, lack of adequate planning,
poor labour output, imprecision of material estimate and shortage in materials are some of the key sources of delay they found out.

In the same way, Owolabi et al., (2014) also carried out a study and it was deduced that inadequate funds to fund a project from conception to its finishing point, ineffective communication among the various stakeholders, constant design alterations, slow decision making by contracting parties involved, and insufficient information from consultants to other stakeholders were some major factors that delayed projects from completing on the agreed time in the contract.

A study was undertaken in Saudi Arabia to ascertain the causes of project delays by Albogamy, Scott and Dawood (2012). The findings of the study revealed that shortage of qualified experts such as engineers and quantity surveyors, inexperience of the contractor’s technical staff, interruptions of sub-contractors work, delay in making interim payments to the contractor, delay in shop drawings preparation, underutilization of specialized construction contractual management, insufficient preparation of the project and inconsistent cashflow to the contractor lead to project delays.

Another similar research was undertaken by Al-Kharashi and Skitmore (2009) in Saudi Arabia revealed that the main roots of delay in the public sector is lack of adequate competent and experienced professionals. Consequently, some common factors of delay found by Haseeb, Xinhai-Lu, Bibi, Maloof-ud-Dyian and Rabbani (2011) is due to natural disaster such as earthquake and deluge. They further went on to state that factors such as scarcity and unskilled labour forces are the key sources of delay. Scarcity and unskilled labour is as a result of inaccurate staff forecasts. They also made known in their study that doings and blunders attributable to the contractor brings about delays, time and capital wastage. Mismanagement of funds was a main factor of project delays as noted in their research.
One hundred and thirty (130) community projects were investigated in Jordan by Al-Momani (2000), and it was deduced that the chief origin of delay were related to the expert doing the drawings, unfavourable climate and locational situations, late deliveries, unstable economy, rise in quantity and change in user. He went on to explain that delays have a solid association with non-effective act and failure of contractors.

Mehzer and Tawil (1998) undertook a study in Lebanon to investigate causes of delay from clients’, contractors’ and professionals’ point of view. They deduced that clients were more bothered with the project funding, contractors well-thought-out contractual dealings as utmost significant and consultants looked at project management. All three stakeholders viewed all these as major issues that contributes enormously to delays on construction projects.

Ghana had some researchers go through a study to identify the substantial elements causing delays in groundwater construction projects. Outcomes gained from this survey showed that the various stakeholders of the project believed that the four (4) core reasons of delay are insufficient project funding, natural, economic and materials condition (Frimpong & Oluwoye, 2003).

Ahmed, Azhar, Kappagantula and Gollapudi (2003) conducted a brief survey in Florida to ascertain factors instigating delay in their construction industry. They realized that causes of project delays can be sorted into two (2): internal and external. They further explained that internal delay factors consist of causes emanating from four (4) stakeholders involved in the project. These stakeholders encompass clients, consultants, designers and contractors. Some of the causes grouped under the various stakeholders involve inadequate materials, lack of adequate plant, bad meteorological conditions, insufficient working knowledge, indecisiveness by the client, constant contract changes, delay in payments, slow down in materials delivery, deprived site running, inexperience on the consultants’ part, delayed and inefficient
supervision. Delays that do not rise from these stakeholders are known as external delays and such emerge from suppliers of material, weather conditions and the government.

Some researchers from Universiti Kebangsaan, Malaysian Campus undertook a survey on the sources of delays. They realized that contractor organization issues, scanty finances, late interim payments, delay in gaining work approval from the necessary authorities, constant additional works, and insufficient materials for construction (Tawil, et al., 2013).

Ali, Smith, Pitt and Choon (2010) undertook a research on factors that play a part in project delay from the Contractors’ Perspective. They found out that seven (7) most important variables which are caused by Contractors lead to project delays. These are material unavailability, shortages of labour, financial constraints on the contractor’s part, poor management of site, inadequate and unavailability of needed plants and tools, mistakes and non-rectification of defective works during the construction phase and management difficulties.

Some sources of non-excusable delays identified by Afshari, Khosravi, Ghorbanali, Borzabadi and Valipour (2011) are delay in bringing resources and tools to the location of the projects, inefficiency in control and management of subcontractors, interruption in drawing detailing, mishandling of project site, ineffective communication among the various stakeholders, unavailable recording device and delay when awarding contract to a subcontractor.

Odeyinka and Yusif (1997) also undertook an exploration to identify the root causes of delays in housing projects in Nigeria. They deduced that insufficient inspection of on-going works on site, irregular flow of cash to facilitate works, sluggishness in decision making, constant variation directive, labour disagreements leading to strikes.

Time and cost escalation were categorised in a study carried out by Kaming, Olomolaiye, Holt and Harris (1997) to determine factors leading to delays. The factors that were found causing
delay under time overrun are shortages of resources to complete the project, constant alterations in design, insufficient planning and underperformance of labour.

2.7.1 Summary of Causes of Delay
From the survey undertaken on the causes of project delays in the literature, it has been discovered by other researchers worldwide, that numerous source of delays were ordinary among countries where these research have been done. Examples of these common delay factors are financial constraints on the contractor’s side, insufficient funding from the clients, constant design alterations, materials shortage, inadequate resources supply, incompetent site management, poor construction supervision and management. Other factors are; ineffective communication among the various stakeholders (i.e. clients, consultants and contractors), delay in payments due the contractor, poor project planning and lack of adequate experienced professionals (i.e. engineers, quantity surveyors and architects). The rest include; unfavourable weather and site conditions, insufficient working knowledge, indecisiveness by the client/sluggishness, delay in materials conveyance to site, and unavailability of needed plants and tools.

2.8 EFFECTS OF DELAYS
Delays can result in diverse effects that can be detrimental to the end of the project. Unlike the causes of delay that may have some limitations due to differences in geographical location, the impact of delays cuts across the globe (Muhammed, 2015). Some effects deduced from a research conducted by Sambasivan, Deepak, Salim and Ponniah (2017) in Tanzania pointed to cost overrun, dispute among stakeholders, litigation, adjudication and complete desertion of the project. These effects arise from either contractor, consultant, labour and equipment, material, external, contract and relationship related matters.
Additionaly, a research undertaken in India showed that an overrun in costs and time were the two most prevalent effects of construction delays (Sha, Shahi, Pandit, & Pandey, 2017). It was found that these effects were from the view point of consultants and contractors. Disputes amongst major stakeholders of the project were also found out by these same researchers. As costs escalate due to delay, there is a high possibility of either the consultant or contractor abandoning the project according (Sha, Shahi, Pandit, & Pandey, 2017).

Another effect of construction delays obtained from the conference proceedings carried out by Aydin and Muhtayanlar (2018) was that the company will gain a corrupted standing among the local folks. They went on to explain that this goes a long way to reduce the assurance the people have in them. They also opined that delay result in poor work quality which stems out from the fact that costs of project have been exceeded.

Additionally, contracting parties, through their claims, generally agree upon the extra cost incurred and time prolongation arising from the delay of ongoing works (Aibinu & Jagboro, 2002). On-site conveyance of materials, plants and equipment through a survey done by Sambasivan and Soon (2007) contributes enormously to project cost overruns, which happens to be one major effect of delay on construction project.

Claims, complete abandonment of the project, clashes among parties and sluggish growth of the construction sector were effects recognized by Haseeb, Xinhai-Lu, Bibi, Maloof-ud-Dyian and Rabbani (2011) in Pakistan’s construction industry. Overruns in cost is a major effect arising from construction project delays, and from a conference proceedings done in Durban by Ramabodu and Verster (2010), revealed that alterations in scope of works on-site is a critical factor steming from overrun in cost. Other grave factors these researchers found were estimation disparity, incomplete drawings at bidding time, contractual claims (i.e. cost steming from time extension), inadequate cost forecasting and funds monitoring.
In Ghana, Chileshe and Berko (2010) conducted a research on projects in the road construction industry and noted that the main causes of overrun in costs are interim payments delay, price rises, and discrepancies in scope of works. Due to this situation of delays, the industry with its stakeholders are undergoing financial waste incessantly and quality losses. The study further revealed that delays in projects affect the economy of the nation on both its macro and micro levels.

Enshassi, Al-Najjar and Kumaraswamy (2009) also explained that project delays at the macro level lead to an undesirable rate of economic growth and financial loss while resulting in dispute adjudications, cost escalation and desertion of the project at the micro level.

Aibinu and Jagboro (2002) conducted a research on project delays in Nigeria and deduced that dispute was an effect that arises from delay in construction project. They identified that it was between the client and contractor for either financial claims for variation or under budget or time extension that leads to the delay of construction projects. They also established that, resolution of mediation is selected to solve disagreements between contracting parties. The researchers expounded more that, issues arising, if not resolved at mediation level, proceed into lawsuit.

Significant effects of project delays were found in a study conducted in the Niger Delta region by Sunjka and Jacob (2013). The study revealed that project delays brings about an overrun in budget. An overrun in budget is explained by the researchers as a project which is finished but at a higher cost than what was initially budgeted for in the contract. They also stipulated that, project delays result in the use of inferior workmanship and materials of low worth. This therefore eventually leads to the final work of delayed projects being poor in quality. It was also brought to light that when there are delays completing a project, the various stakeholders involved put their public credibility and repute at risk. Another main resultant factor arising
from delay is when the agreed completion time is moved forward, the project is said to have experienced an overrun in time. Disputes may also arise which lead to a lawsuit for resolution expressly when large consequences are involved. Another outcome of delay identified are cost incurred and time lost in relation to the engagement of expert intermediaries. The study concluded that delay in implementation of a project could lead to a total relinquishment if problems bringing about these delays are not fixed on time.

A research conducted by an Engineer in Iraq, Muhammed (2015), established that cost escalation is the cost in excess of the agreed contract sum. The study explained further that additional cost of a project poses problems to the parties involved. For government, tax payers do not get value for their money due to a rise in cost. Likewise, the contractors may experience losses in revenue and a disruption in cash flow. Clients lose credence in the implementation plan of the contractors as delays on their part tarnish their reputation. Through its findings, Muhammed (2015) revealed that the various stakeholders can turn their backs on the project when it experiences delays. He elaborated further that project delays bring about a reduction in employment prospects. The situation also causes the government to lose revenue, render investor dissatisfaction and slows down economic pursuit.

These principal effects, which occur globally, were identified by the researcher in the quest to examine the impact discovered by previous studies on project delays around the world. The findings of Muhammed (2015) established that an escalation in costs, exceeding of time beyond what is agreed upon in the contract, dispute between parties involved in the contract, litigation, adjudication, unusual losses and total desertion of the entire project are some of the effects of project delays.
2.9 SOLUTIONS SUGGESTED TO MINIMIZE DELAYS

Below are some suggested solutions found, through the researcher’s survey of the literature, to help curb project delays to the barest minimum. Aibinu and Jagboro (2002), for instance, gave some solutions that are clients specific to aid in reducing delays on projects.

i. Clients-related suggested solutions

Aibinu and Jagboro (2002) were of the view that contractor selection should not be based mainly on the one with the lowest evaluated amount. They suggested that the contractor to be selected must be financially capable, have adequate work force to undertake the project and importantly, have enough experience. These researchers suggested further that when contractors are carrying out project works, clients should interfere less frequently and variations must not be made often to ensure on-time completion of the project (Ajanlekoko, 1987).

A study done by Sambasivan and Soon (2007) suggested that clients should make finances available on time in order to pay contractors after completion of works in accordance to timelines agreed upon in the contract document. They were also of the opinion that clients should work closely with the institutions and agencies in charge of the project financing to make them release payment as planned and agreed on.

Similarly, Alkass, Mazerolle and Harris (1996) prescribed, in their studies, that quick resolutions to issues rising during the implementation of the works must be made by the clients to prevent further delays. Clients, according to Alinaitwe, Apolot and Tindiwensi (2013), are shown to lessen changes in work scopes, as this influences cost to rise and makes the work timelines to go beyond the completion date.

In Ghana, a study was done by Fugar and Agyarkwah-Baah (2010) revealed that the bureaucracy involved in contractor payments is cumbersome. They stated that this process must
be reduced in order to promote efficacy. The researchers suggested that payments of contracts should be provided under stringent compliance in conjunction with the requirements of the contract. They further went on to explain that contract conditions which allow contractors to be entitled to compensation for late payments must be stringently applied to serve as a caution to clients. This resonated well with the recommendation that the Ministry of Works and Housing (the body in charge of contractors’ registration and classification), must insist on the requirements that contractors wishing to execute public projects must have. These include the condition that such contractors should have a definite vital technical staff.

Due to the system of change in Government every four years in Ghana, delay in honouring contract payments can occur. In this regard, Kasimu and Issah (2012) in their study done in Nigeria suggested that apt planning and reimbursement on the part of client must be done. This minimizes delay in payment even when there is a change in Government.

Kikwasi (2012) mentioned in his research that adequate construction budget must be alloted by the clients of construction projects. He also made plain the fact that clients must issue information on time.

ii. Consultants-related suggested solutions

Aibinu and Jagboro (2002) have suggested that to solve the problem parties involved in contracts should ensure that while a contract is been drawn, between a client and a contractor, items such as devices to evaluate causes of delay, mechanism to resolve disputes that may arise amid contracting parties, contract period and any risk controlling strategies must be built-in. In a study conducted by Ajanlekoko (1987), it was proposed that designs and drawings should be prepared and agreed on time by consultants before the commencement of projects. According to Sambasivan and Soon (2007), a close observation of on-going works on site by way of undertaking inspections at suitable times ought to be done by project consultants.
Management of a project as recommended by Alinaitwe, Apolot and Tindiwensi (2013) is to be enhanced, with a modification in emphasis towards more joint relations with other stakeholders, which would help minimize delays in payments to contractors. They went on to state that this will help increase cash flows on the client’s part and cut down the complete costs of the project.

Bordat, McCullouch, Labi and Sinha (2004) asserts that in order for consultants to attain design free errors, there must be appropriate communication amongst the whole design team, suitable planning and giving of adequate time to put up the right design free from errors. Additionally, the researchers posited that all-encompassing investigation and evaluations during design stage are necessary prerequisite to reduce construction project delays. Design should be finalized by the entire design team and project management skills should be the main focus during the procurement of project process (Kikwasi, 2012).

iii. Contractor-related suggested solutions

Aibinu and Jagboro (2002) suggested that contractors must not take up a project in which they have insufficient know-how. Able site managers who can efficiently and smoothly effect works on site ought to be taken by the contractor (Ajanleoko, 1987). Studies of Sambasivan and Soon (2007) stated that a complete programme of works which has been prepared appropriately and a thoroughly made plan need to be presented to the clients. Contractors must make sure that they have a comprehensive financial aid (Alkass, Mazerolle, & Harris, 1996).

2.9.1 Summary of Recommended Solutions

The various literature on recommended solutions of delay outlined above show that delays are inevitable globally but vary from country to country. In a bid to find ways to help curb delays to its barest minimum, these solutions were developed; clients must not only have their focus on selecting contractors with the lowest evaluated sum but also need to consider other factors. Finances should be made available in time by clients in order to pay contractors upon
completion of works in accordance with the timelines agreed upon in the contract document. Designs and drawings should be prepared and agreed on time by consultants. While a contract is been drawn between a client and a contractor, items such as measures to evaluate causes of delays, dispute resolution mechanism, and risk controlling strategies must be built-in. Also, contractors must not take up a project in which they do not have adequate experience or expertise. Complete programme of works and a thouroughly made work plans have to be presented by the contractor for the client’s approval.
CHAPTER THREE
METHODOLOGY

3.1 INTRODUCTION
Here, the section details the processes and approaches used to accomplish the targets and purposes of the research. The design and strategy used, in addition to methods and techniques used in collecting and analysing data are discussed in this chapter.

3.2 RESEARCH APPROACH
A quantitative method of research by means of a well-structured questionnaire was employed to gather data regarding the causes, effects and strategies to mitigate delays on construction projects.

3.3 SAMPLING TECHNIQUE
A purposive sampling approach was used in determining the sample for this study. The sample consisted of building professionals (architects, civil engineers and quantity surveyors) in the construction industry.

3.3.1 Population Definition
Respondents that undertook this survey were limited to Ministry of Works and Housing, and Ministry of Roads and Highways who serve as clients on behalf of Government and Consultants such as Architects, Civil Engineers, and Quantity Surveyors who are listed under their various specialized organizations. Some contractors who qualify to engage in public projects were also included in the survey.

3.3.2 Determination of Sample Size
The Kish formula was employed in the determination of the appropriate sample size for the various categories of participants in the survey. The formula is given as follows;
\[ n = \frac{n^1}{1 + \frac{n^1}{N}} \]

But \( n^1 = \frac{s^2}{v^2} \); \( S^2 = P(1 - p) \)

Where:

\( N = \) Total population size
\( n = \) sample size
\( S = \) maximum standard deviation among the population of elements (Total error of 0.1 at a confidence interval of 95%)
\( V = \) standard error of the distribution assumed to be 0.05
\( P = \) the part of population elements that belonged to the demarcated class (50%) was applied for the determination of the sample size.

Table 3.1 below indicates the sample size used for this research.

<table>
<thead>
<tr>
<th>Respondent class</th>
<th>Population</th>
<th>Sample Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Civil engineers</td>
<td>2,565</td>
<td>96</td>
</tr>
<tr>
<td>2. Quantity surveyors</td>
<td>893</td>
<td>90</td>
</tr>
<tr>
<td>3. Architects</td>
<td>1,083</td>
<td>92</td>
</tr>
<tr>
<td>4. Clients</td>
<td>28</td>
<td>22</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>4,569</strong></td>
<td><strong>300</strong></td>
</tr>
</tbody>
</table>

3.4 DATA COLLECTION

3.4.1 Questionnaire Design

The questionnaires came in three parts; Part I laid an emphasis on the vital delay causes; Part II had its focus on the impact of acknowledged delay causes occurring on government-funded construction projects in Ghana, and Part III concentrated on solutions to minimize these delays. A Likert scale which ranged from 1 (not significant) to 5 (extremely significant) was used.
during the field survey to point out level of significance of each of the causes and effects. The participants were questioned further to rank the mitigating factors to solve the issue of delays on a scale of 1-5 where 1 = “Not important” to 5 = “Very important”.

3.4.2 Questionnaire administration

A total of three hundred (300) questionnaires were administered to registered construction professionals. Ninety-six (96) were sent to engineers, ninety (90) were distributed to quantity surveyors and the remaining ninety-two (92) to architects. Twenty-two (22) questionnaires were sent out to clients who are with the Ministry of Works and Housing, and Ministry of Roads and Highways. All these were sent via electronic means (emails and social media), as stated earlier, to the various participants.

3.5 ANALYSIS OF DATA

The concluded questionnaires were revised to certify uniformity, inclusiveness and readability. As soon as the information was scrutinized, they were organized in a layout that permitted uncomplicated enquiry. Measurable information from the questionnaires was coded into a software for analysis. Two statistical analysis tools were used. Data received for strategies to aid alleviate delays were analysed using the Relative Importance Index (RII) method.

\[
\text{RII} = \frac{\text{Sum of weights (W1 + W2 + W3 + \ldots + Wn)}}{\text{A x N}}
\]

Where:

\( W = \) weights given to each factor by the respondents and ranges from 1 to 5, where ‘1’ is not important and ‘5’ is extremely important

\( A = \) highest weight (i.e. 5 in this case)

\( N = \) total number of respondents

Mean Score Ranking was also used which aided in ranking the responses of the factors that causes delays and effects arising thereof. Cronbach’s alpha is a coefficient of reliability, which was used to measure the internal consistency from the responses of participants. Statistical
Product for Social Scientists (SPSS) and Microsoft Excel were the software used to run the data received.

3.6 CHAPTER SUMMARY

The purpose of the chapter was to discuss the methodological approach used in conducting the study. It explained how the sample population was chosen and the sample size determination. The processes used in designing of the data collection instrument were described. A description in the administration of the questionnaires and a breakdown of the questionnaire was emphasized. Afterwards, arithmetical tools used in analysing the data were stated. With this background, statistical results acquired from the data are discussed in the next chapter.
CHAPTER FOUR
DATA ANALYSIS AND DISCUSSION

4.1 INTRODUCTION

The outcomes and discussions of the field survey are presented in this chapter following data collection. Out of three hundred (300) questionnaires sent to the various construction professionals, two hundred and thirty (230) were retrieved from respondents. Discussions have been done on the views of the respondents extensively on the causes, effects and ways to mitigate delays on government-funded projects.

The analytical tools employed were the Relative Importance Index (RII) and the Mean Score Ranking. Results received from respondents have been presented and interpreted below in graphs and a table.

4.2 CAUSES OF DELAYS AND TIME PERFORMANCE ON GOVERNMENT CONSTRUCTION PROJECTS

This section examined the causes of delay and time performance. The mean score for each cause was ranked as shown in Figure 4.1 below. After gathering the research data, Cronbach’s alpha coefficient was used to assess the reliability of the 5-point Likert Scale by measuring the internal consistency of the various causes of delays. In this study, the Cronbach’s alpha coefficient value for the causes of delays were greater than 0.7, which denotes that the data collected were highly reliable for further analyses.
Figure 4.1 Causes of delays
4.2.1 Insufficient funding from clients

Figure 4.1 above indicates that insufficient funding from clients ranked as the most critical factor causing delay of government-funded construction projects in Ghana. Delays of construction projects in most countries may arise when a client does not release funds on time during relevant phases of projects’ execution and interim payments are not paid early enough to contractors due to bureaucracy. These lapses lead to delay in delivery of resources to site and subsequently lead to delay in on time completion of projects. This delay factor substantiates the findings of Sunjka and Jacob (2013), Frimpong and Oluwoye (2003), Mehzer and Tawil (1998), and Owolabi et al., (2014). It confirms that insufficient funding from clients is a common happening across the globe.

4.2.2 Payment due the contractor

The second major cause of government-funded projects identified was delay in payment due the contractors. Government in both developed and developing countries are the key financier of most public sector projects, this explains why disbursements of budgetary allocations to undertake various projects become irregular in most countries. Delay in payments due contractor affects considerably the cash flow of the contractor, which delays the procurement of materials to undertake the construction works. This adversely brings about delays on projects’ completion. Consequently, time performance is affected. In the same way, Sunjka and Jacob (2013) and Kikwasi (2012) ranked this delay factor as second most significant. However, Amoatey, Ameyaw, Adaku and Famiyeh (2015) ranked this cause of delay as the most significant cause of delay amongst thirteen highly ranked cause factors.

4.2.3 Poor Project Planning

Poor project planning was identified from the mean score ranking as the third most significant factor that causes delay on government-funded project. Project managers on construction
projects are expected to draw up effective project plans which can be implemented with ease. Inadequate planning impairs project progress monitoring. These discrepancies often lead to the occurrence of delay in project completion time. Poor project planning was ranked as the 3rd most significant cause by Kaming, Olomolaiye, Holt and Harris (1997) and Sunjka and Jacob (2013). These researchers were of the opinion that poor project planning mostly leads to delay and results in cost and time overruns.

4.2.4 Financial Constraints on the contractor

Financial constraints on the contractor had a standard deviation of 1.013, which signifies that respondents had varying views on this variable. Financial constraints can cause setbacks such as decline in contractor’s productivity and sluggish progress of works on site. The needed tools and equipment will not be purchased for the smooth running of works. In Thailand, Ogunlana, Promkuntong and Jearkjirm (1996) did not consider financial constraints as a vital cause of delays. On the contrary, Alaghbari, Kadir, Salim and Ernawati (2007), Chan and Kumaraswamy (1997) and Enshassi, Al-Naijar and Kumaraswamy (2009) had findings that substantiated that financial constraints on the contractor is a key factor that brings about delays on construction projects.

4.2.5 Delay in conveyance of material to site

Respondents were all of the view that delay in conveyance of material to site is a factor that brings about delay on government-funded projects due to its standard deviation of 0.880 and ranked as one of the last three of the delay causes. Delay in the supply of materials to site implies mishandling by contractors. The failure of conveying materials to site on time implies that human resources will be idle and delay will occur. This result concurs with the results of Enshassi, Al-Naijar and Kumaraswamy (2009) which ranked this delay as fourth.
### 4.2.6 Materials shortage

Materials shortage is ranked last but one important cause of project delays. From the responses of the respondents there was a varying views on this variable due to a standard deviation of 1.283. This delay variable results in activities, slowing down on site work and can lead to temporary abandonment of site. Contractors who do not have their own stores on site to keep construction materials delay in completing projects due to the time use in transporting them to the project site. This slows down the pace of works and brings about delays. Sunjka and Jacob (2013) ranked materials shortage as a 2nd main factor that causes delay under their materials-related issues. Enshassi, Al-Najjar and Kumaraswamy (2009) in their findings, however, ranked materials shortage as a third important factor which is contrary to this study which deems this factor a minimal cause of delays.

### 4.2.7 Unfavourable weather and site conditions

Unfavourable weather and site conditions was the last ranked variable, respondents viewed it as having a relatively lower impact on the on-time completion of the project. Ghana has good climatic conditions, hence the weather condition does not affect the carrying out of projects but improper weather forecast projections by contractors/consultants can cause site works slowing down and subsequently lead to delay in the final completion of works.

### 4.3 EFFECTS OF DELAYS AND TIME PERFORMANCE ON GOVERNMENT CONSTRUCTION PROJECTS

After gathering the research data, Cronbach’s alpha coefficient was used to assess the reliability of the 5-point Likert Scale by measuring the internal consistency of the various effects of delays. In this study, the Cronbach’s alpha coefficient value for the effects of delays were greater than 0.7, which denotes that the data collected were highly reliable for further analyses.
Figure 4.2 Effects of delays
In order to determine the relative significant effects of the delays, the Mean Score Ranking was also used to calculate for each effect factor. From Figure 4.2 above, the results show that cost overruns, time overruns and loss of revenue were the three highest effects of delay and undesirable rate of economic growth, adjudication and reduction in employment prospects were the least significant.

4.3.1 Cost overruns

This was considered as the most significant effect of project delays on government-funded projects in Ghana in the views of the respondents. Cost overrun is defined as a project exceeding its planned budget. Imprecision of cost estimates, poor project planning, constant design alterations, delay in interim payments, and increase in material prices are main reasons for cost overruns. This happens when the project delays and exceeds the completion time agreed on in the contract document. Cost overruns causes the project to end at a higher cost than the initially budgeted cost. Chileshe and Berko (2010), Sambasivan, Deepak, Salim and Ponniah (2017), Sha, Shahi, Pandit and Pandey (2017), Sambasivan and Soon (2007), Haseeb, Xinhai-Lu, Bibi, Maloof-ud-Dyian and Rabbani (2011) reported that cost overruns was the most significant effects of delays on construction projects. This can be said to be a worldwide occurrence on construction projects.

4.3.2 Time overruns

The second most important effect of delay and time performance identified on government-funded projects is time overruns. Inappropriate site supervision, lack of adequate experience of project handling by contracting parties and insufficient planning brings about delay. This consequently pushes the stipulated completion time beyond the initially agreed time. Time overrun can be considered to be an effect that occur in the construction industry, globally. Similarly, Sunjka and Jacob (2013) and Sha, Shahi, Pandit and Pandey (2017) in their results ranked time overruns as the second most important effect of delays.
4.3.3 Loss of revenue
Loss of revenue was ranked as 3rd and it is deemed as important through the data analysis. Delays on government-funded project affects the economy of a nation on the macro level. When infrastructure that is government-funded is delayed which reduces productivity of the working class, delay occurs and results in government loosing revenue.

4.3.4 Undesireable rate of economic growth
Respondents viewed this as a minimal effect of delays and time performance on construction projects and it was ranked as one of the last three effects that result from project delays. It can be seen that respondents had differing views on this effect due to its standard deviation of 1.079. Delays on government-funded projects do not directly result in undesireable rate of economic growth. The finding in this study confirms the result of Chileshe and Berko (2010), who in their study, concluded that delays result in an undesireable rate of economic growth on a macro level.

4.3.5 Adjudication
Adjudication was ranked as one of the last two effect of delays on government-funded projects. When delays arises on construction projects, it can result in adjudication. The cost and time involved to engage professional arbitrators are costly. This finding is in consonance to the finding of the study conducted by Sunjka and Jacob (2013) in the Niger Delta area.

4.3.6 Reduction in employment prospects
This effect was ranked last and it is not deemed as a direct result of delay causes on government-funded project. When there are delays on government-funded project due to insufficient funding from clients and materials shortage, it leads to delay in employment of human resources. According to this analysis, reduction in employment prospects was not an important factor resulting from causes of delay.
### 4.4 Strategies to Alleviate Delays

<table>
<thead>
<tr>
<th>COMPETENCIES</th>
<th>FREQUENCY OF RANKING</th>
<th>TOTAL</th>
<th>ΣW</th>
<th>MEAN</th>
<th>RII</th>
<th>RANKING</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Designs and drawings should be prepared and agreed on time by consultants</td>
<td>-</td>
<td>6</td>
<td>12</td>
<td>52</td>
<td>134</td>
<td>204</td>
</tr>
<tr>
<td>Finances should be made available in time by clients in order to pay contractors upon completion of works in accordance with the timelines agreed upon in the contract document</td>
<td>-</td>
<td>6</td>
<td>12</td>
<td>59</td>
<td>127</td>
<td>204</td>
</tr>
<tr>
<td>Thoroughly made work plans have to be presented by the contractor for the client’s approval</td>
<td>-</td>
<td>10</td>
<td>29</td>
<td>77</td>
<td>88</td>
<td>204</td>
</tr>
<tr>
<td>Contractors must not take up a project in which they do not have adequate experience or expertise</td>
<td>-</td>
<td>18</td>
<td>28</td>
<td>59</td>
<td>99</td>
<td>204</td>
</tr>
<tr>
<td>Dispute resolution mechanism</td>
<td>-</td>
<td>-</td>
<td>63</td>
<td>65</td>
<td>76</td>
<td>204</td>
</tr>
<tr>
<td>Clients must not only have their main focus on selecting contractors with the lowest evaluated sum</td>
<td>23</td>
<td>-</td>
<td>24</td>
<td>74</td>
<td>83</td>
<td>204</td>
</tr>
</tbody>
</table>

Source: Field survey, July 2019
The RII was used to indicate the level of significance of the proposed strategies that will assist in the alleviation of the delays found in this study.

The strategy that was ranked first proposed that designs and drawings should be prepared and agreed on by the parties involved in the project in project time, especially by the project consultants. It can be deduced that respondents found this strategy as extremely significant to aid in delay alleviation. Similarly, Bordat, McCullouch, Labi and Sinha (2004), and Alinaitwe, Apolot and Tindiwensi (2013) suggested same in their findings. This comes to validate that this strategy is a measure that when implemented can help minimize delays on government-funded projects in Ghana.

Finances should be made available on time by clients in order to pay contractors upon completion of works in accordance with the timelines agreed upon in the contract document. This strategy was ranked second most significant strategy. The research results of Sambasivan and Soon (2007) were similar to this finding. This highlighted the level of importance of this strategy when implemented by clients to help mitigate delays on government construction projects.

The next strategy that has a significant level of impact in curtailing delays in construction projects is a thoroughly made work plans. Thus, a thoroughly made work plans have to be presented by the contractors for their clients’ approval. This strategy has an RII of 0.838, which signifies the importance of this strategy. The findings of Sambasivan and Soon (2007) also highlighted this strategy’s significance. A complete programme of works which has been prepared appropriately needs to be presented to the clients before the construction phase begins. This strategy will aid in the alleviation of delays.

Clients must not only have their main focus on selecting contractors with the lowest evaluated sum came in as the least significant factor to aid in alleviation of delays. On the contrary, the
findings of Aibinu and Jagboro (2002) considered this factor very significant. Notwithstanding, this factor must be adhered to, to aid alleviate the delays on government-funded projects.

4.5 CHAPTER SUMMARY

This chapter dealt extensively with the analysis of data received from the survey and findings were discussed thoroughly. It started with a brief discussion of the administered questionnaires and the response rate from respondents. The analytical tools used to analyze the data were Mean Score Ranking that was used to rank the importance of the causes and effects of delay on government-funded projects. Relative Importance Index (RII) was used to rank and calculate the strategies to aid in the mitigation of delays. Cronbach Alpha was used in the determination of the internal consistency of the various variables.
CHAPTER FIVE
CONCLUSION AND RECOMMENDATIONS

5.1 INTRODUCTION
This study makes available a summary of the entire research by drawing in findings achieved from analyzing data received from respondents. It further places the findings of the study in the right perspective by drawing on results found to provide significant inferences that will guide government, construction professionals and policy makers to mitigate delays on projects.

5.2 SUMMARY OF RESEARCH FINDINGS
The first objective set out focused on causes of delays on government-funded projects in Ghana. The study sought the views of the various construction professionals on the factors that brings about delays on construction projects. The research indicated that the various respondents in general agreed that out of 17 factors, the top five causing delays were insufficient funding from clients, delay in payments due the contractor, poor project planning, financial constraints on the contractor and underestimation of project duration.

The second objective sought to determine the effects of delays on government-funded projects. The three most substantial effects found out of 12 factors were cost overruns, time overruns and loss of revenue.

5.3 CONCLUSIONS AND RECOMMENDATIONS
The study concludes that delays on construction projects put construction works at great risk and consequently have effects on-time delivery of projects. Consultants must prepare and agree on designs and drawings on time, and finances to pay contractors must be made readily available by government which can aid mitigate the causes found out from the research. Thoroughly made work plans have to be presented by the contractor for the client’s approval and contractors must not take up a project in which they do not have adequate experience.
Hence, it is recommended that sufficient construction budget must be made available by government before embarking on construction projects. Issuing of information on time by the contracting parties and finalization of drawings and designs among consultants also need to be ensured by the parties involved in the project. These recommendations should guide government, policy makers and construction practitioners to aid in the smooth and on time completion of construction project.

Finally, further study can be done in the future to ascertain the measures that can be put in place by contractors to mitigate delays on public funded road projects.
REFERENCES


APPENDICES

APPENDIX A- SAMPLE SIZE CALCULATION

i. Sample size of Civil Engineers (registered under GhIE)

A total number of two thousand, five hundred and sixty-five (2,565) civil engineers were considered for the survey.

Using \( N = 2,565 \), \( V = 0.05 \) and \( P = 0.50 \)

\[
S^2 = 0.50(1 - 0.50)
\]
\[
S^2 = 0.25
\]

\[
n^1 = \frac{S^2}{V^2}
\]
\[
= \frac{0.25}{(0.05)^2}
\]
\[
= 100
\]

\[
n = \frac{n^1}{1 + \frac{n^1}{N}}
\]
\[
n = \frac{100}{1 + \frac{100}{2565}}
\]
\[
= 96.25 \sim 96
\]

\[\therefore \text{Total number of Engineers} = 96\]

ii. Sample size of Quantity Surveyors (registered under GhIS)

A total number of eight hundred and ninety-three (893) quantity surveyors were considered for the survey.

Using \( N = 893 \), \( V = 0.05 \) and \( P = 0.50 \)

\[
S^2 = 0.50(1 - 0.50)
\]
\[
= 0.25
\]

\[
n^1 = \frac{S^2}{V^2}
\]
\[
\frac{0.25}{(0.05)^2} = 100
\]

\[n = \frac{n^1}{1 + \frac{n^1}{N}}\]

\[
n = \frac{100}{1 + \frac{100}{1083}} = 89.93 \sim 90
\]

\[\therefore \text{Total number of Quantity Surveyors} = 90\]

iii. Sample size of Architects (registered under GIA)

A total number of one thousand and eighty-three (1,083) architects were considered for the survey.

Using \(N = 1,083\), \(V = 0.05\) and \(P = 0.50\)

\[S^2 = 0.50(1 - 0.50) = 0.25\]

\[n^1 = \frac{S^2}{V^2} = \frac{0.25}{(0.05)^2} = 100\]

\[n = \frac{n^1}{1 + \frac{n^1}{N}}\]

\[
n = \frac{100}{1 + \frac{100}{1083}} = 91.55 \sim 92
\]

\[\therefore \text{Total number of Architects} = 92\]
iv. Sample size of Clients (Ministry of Works and Housing and Ministry of Roads and Highways)

A total number of twenty-eight (28) clients were considered for the survey.

Using $N = 1,083$, $V = 0.05$ and $P = 0.50$

- $S^2 = 0.50(1 - 0.50)$
  
  $= 0.25$

- $n^1 = \frac{S^2}{V^2}$
  
  $= \frac{0.25}{(0.05)^2}$
  
  $= 100$

- $n = \frac{n^1}{1 + \frac{n^1}{N}}$
  
  $n = \frac{100}{1 + \frac{100}{28}}$
  
  $= 21.88 \sim 22$

∴ Total number of clients $= 22$
APPENDIX B

QUESTIONNAIRE

TOPIC: CAUSES OF DELAY AND TIME PERFORMANCE ON CONSTRUCTION PROJECTS – “THE GHANAIAN CASE”

I wish to solicit your honest view on the above mentioned topic. The questionnaire is designed to sample views from professionals. The information would be vital for identifying the most important causes and effects of delays on construction projects in Ghana.

Section A

Objective: To ascertain critical issues that bring about delays on Government construction projects. On a scale of 1 – 5, indicate the level of importance of the following causes of delays on Government construction project.

<table>
<thead>
<tr>
<th>No.</th>
<th>Causes of Delays</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>Financial constraints on the contractor</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Insufficient funding from clients</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Constant design alterations</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Materials shortage</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Inadequate Resources Supply</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Incompetent site management</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Poor construction supervision and management</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Ineffective communication among contracting parties</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Delay in payments due the contractor</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Poor project planning</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Inadequate experienced professionals</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Unfavourable weather and site conditions</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Deficiency in working knowledge</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Slow decision making by clients</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Delay in conveyance of material to site</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Unavailability of needed plants and tools</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Underestimation of project duration</td>
<td></td>
</tr>
</tbody>
</table>

If other, please specify………………………………………………………………………………
Section B

**Objective:** To establish the effects arising from these delays on Government construction projects.

On a scale of 1 – 5, indicate the level of significance of the following effects of delays on Government construction project.

<table>
<thead>
<tr>
<th>No.</th>
<th>Effects of Delays</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>1</td>
<td>Cost Overruns</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Dispute between contracting parties</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Poor work quality</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Time overruns</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Litigation</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Undesirable rate of economic growth</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Loss of revenue</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Loss of credence</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Reduction in employment prospects</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Investors dissatisfaction</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Total abandonment of the project</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Adjudication</td>
<td></td>
</tr>
</tbody>
</table>

If other, please specify………………………………………………………………………………
Section C

**Objective:** To determine strategies that will assist in alleviating delays.

On a scale of 1 – 5, indicate the level of significance of the following strategies to assist in the alleviation of delays.

<table>
<thead>
<tr>
<th>No.</th>
<th>Strategies</th>
<th>Rank</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Clients must not only have their main focus on selecting contractors with the lowest evaluated sum</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Finances should be made available in time by clients in order to pay contractors upon completion of works in accordance with the timelines agreed upon in the contract document</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Designs and drawings should be prepared and agreed on time by consultants</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Dispute resolution mechanism</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Contractors must not take up a project in which they do not have adequate experience or expertise</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Thoroughly made work plans have to be presented by the contractor for the client’s approval</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

If other, please specify………………………………………………………………………………………………